# Wood Heating

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# Wood Heating

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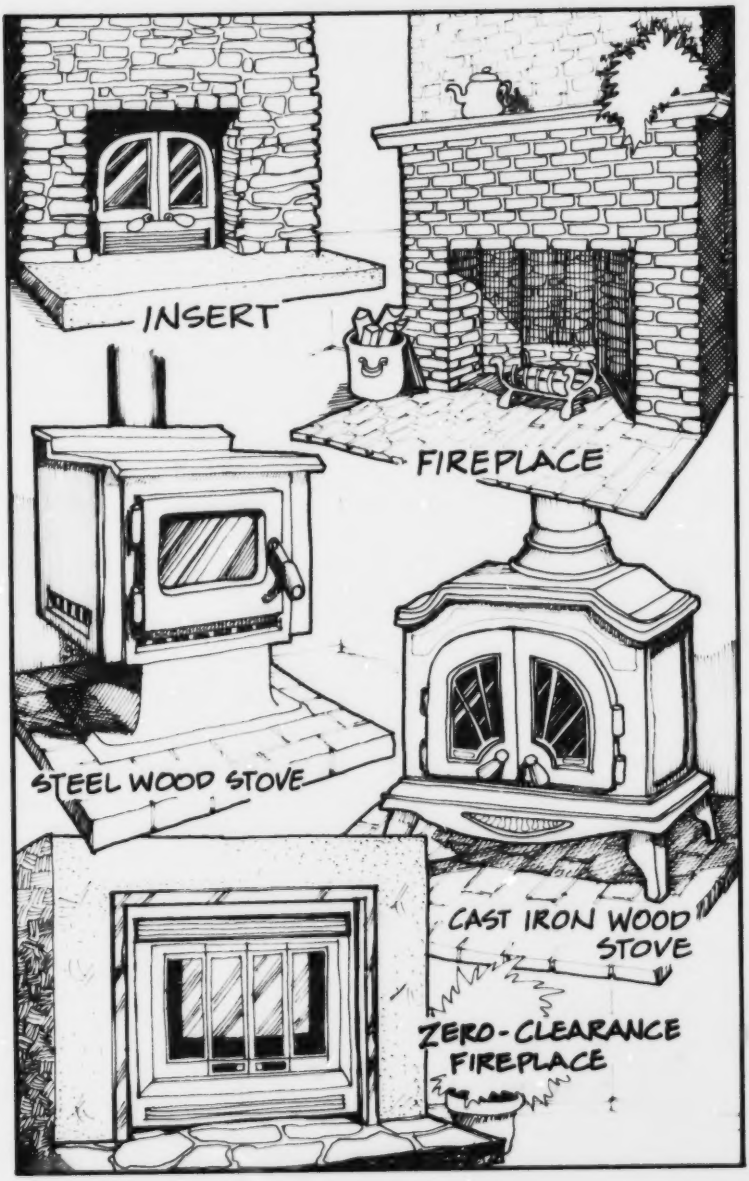
INSERT
FIREPLACE
STEEL WOOD STOVE
CAST IRON WOOD STOVE
ZERO-CLEARANCE FIREPLACE

# Introduction

A fireplace or stove can be both fun and useful. Not only is a fire pleasant to watch, it also can provide all or some of the heat for your home.

If you are interested in wood heating, think your decision through carefully and plan ahead. This booklet will help you with information about cost and convenience, choice in fireplaces and stoves, and the sizing, installation, operation and maintenance of appliances. It also looks at some of the differences between heating with wood or coal. The booklet does not cover wood or coal furnaces, furnace add-ons or boilers. **For more information on these appliances, call the toll-free Energy Matters line (dial zero and ask the operator for Zenith 22339 or call 427-5300 in Edmonton).**

You should read all the information before you look for a fireplace or stove. For example, details about installation, operation and maintenance affect where you can put an appliance and may change your mind about the fireplace or stove you buy.

# Why Do You Want to Burn Wood?

Is it for recreation or heating? If you are more interested in enjoying the sight and sound of a fire, choose wood over coal. Coal glows when it burns but wood gives a bright, crackling fire. Your choice in appliances will also be more limited if you use coal, because it burns hotter than wood and needs a specially designed stove.

You can burn wood in stoves or fireplaces. When we talk about stoves in this booklet, we mean airtight, free-standing appliances that allow a controlled rate of burn. Fireplaces are not as airtight and their rate of burn cannot be controlled as easily, if at all.

For recreation, fireplaces have some advantages. They generally give a better view of the fire and are easier to operate. A well-designed, factory-built fireplace, or one of the improved masonry designs, is a good choice for recreation. Compared to conventional open fireplaces, they are more efficient and less drafty and cold. (We give tips for improving conventional fireplaces later in the booklet.) A well-designed fireplace will contribute heat to your home, but it should still be considered a recreational appliance. Do not rely on a fireplace as your main heat source.

If your objective is to use wood to heat your home, look for an efficient and properly sized stove. Although we do not discuss them in this booklet, coal or wood furnaces and boilers are other space-heating options. Stoves can be very attractive and most now come with glass doors that allow you to see the fire. But stoves designed for space heating are not recreational appliances and require careful operation.

# Does Wood Heating Make Sense for You?

Before you decide to heat with wood, consider the convenience and cost.

You will take on new responsibilities with wood heating. Keeping your house warm will not be as automatic as turning up the thermostat. Here are some of the chores you can expect.

- Refuel the appliance every few hours. If you are away from your house for long periods of time, coal may be a more convenient fuel for you than wood. Coal sustains a fire longer – about twice as long as aspen, for example.
- Check the stovepipe and chimney frequently for creosote, a smoke residue that can cause dangerous chimney fires.
- Clean out the ashes.
- Clean the creosote out of the stovepipe and chimney regularly.
- Check the appliance and chimney every year for signs of wear and corrosion.
- Store your wood properly, and cut, split and haul it if you harvest your own trees.

These tasks can be enjoyable, but they do require your attention and time. Be sure you can fit them into your schedule before you decide to heat with wood.

In Alberta, you need a cheap, secure supply of wood or coal to keep the costs competitive with natural gas. Table 1 compares the costs of heating with purchased wood, wood harvested by the user, coal, natural gas, and propane. The costs presented in the table are rough and will vary around the province, especially fuel costs. Use the list of expenses in the table to develop a more accurate comparison for your area.

**Table 1**

**Heating Cost Comparisons (1988 prices)**

| | User-harvested Wood | Purchased Wood | Coal | Natural Gas | Propane |
|---|---|---|---|---|---|
| **Set-Up Costs** | | | | | |
| Chainsaw | $450-500 | | | | |
| Splitting Maul | $20 | $20 | | | |
| Appliance | $800-1200 | $800-1200 | $1300-1400 | $450-500 | 450-500 |
| Chimney | $400-450 | $400-450 | $400-450 | | |
| Cleaning Equip | $65 | | | | |
| Storage | | | $100 | | |
| Other | | | | Hook-up fee for unserviced lots | |
| **Operating Costs/Yr** | | | | | |
| Fuel costs* | $0 | $4.80 GJ (aspen) | $1.78 GJ | $2.53GJ | $6.40 GJ |
| Maintenance | $0 | $100 | $100 | Negligible | Negligible |
| Other | | | | $100 fixed service fee | $120 yr storage tank rental |

* 1 GJ = 948 000 BTU

The calculations assume that all the heaters are about the same efficiency (60 per cent) and size (40 megajoules per hour output or 38 000 BTUs per hour). This means that the gas and propane appliances are direct-vented space heaters rather than furnaces. The cost of chimneys for wood and coal heaters assumes they are installed on the main floor. The table assumes that the user who harvests his own wood also cleans his own system and that the purchased wood or coal systems are professionally cleaned twice a year.

Using Table 1, you can calculate "paybacks", or how quickly one fuel pays for itself in savings compared to another fuel. A payback is the difference in set-up costs between any two fuel types divided by the difference in annual operating costs.

$$\text{payback} = \frac{\text{difference in set-up costs}}{\text{difference in operating costs/year}}$$

The smaller the payback, the better the investment.

If each appliance in Table 1 contributes 100 gigajoules (94.8 million BTUs) of space heating every year, the paybacks of wood and coal compared to gas and propane are as follows:

- user-harvested wood pays back in 3.5 to five years compared to gas, 1.5 to two years compared to propane.
- purchased wood does not pay back against gas, but pays back in four to seven years compared to propane.
- coal pays back in 17 to 20 years compared to gas, three years compared to propane.

If you have to bring in natural gas to an unserviced lot, the hook-up fee will make coal and wood more competitive with gas.

# Choices in Stoves and Fireplaces

This section describes the most common design options for stoves and fireplaces and looks at how they affect the safety, durability and efficiency of the appliances. It begins with some definitions and principles on efficient wood heating.

The overall efficiency of an appliance is a combination of combustion and heat transfer efficiency.

**Combustion efficiency** is a measure of how completely a fuel burns. The more completely it burns, the more heat it produces and the higher the combustion efficiency. A fire with nearly perfect combustion leaves little ash or smoke and most of the energy in the fuel is converted to heat. To burn completely, wood needs adequate air, a good mixture of the air with hot gases from the fire, high temperatures in the firebox (or a catalyst that allows gases to burn at a lower temperature), and adequate time at high temperatures.

**Heat transfer efficiency** compares the amount of heat delivered to your house by a fire to the amount lost up the chimney. The less heat lost, the higher the heat transfer efficiency. Efficient heat transfer requires an appliance with a large surface area, a firebox uninsulated from the inside, long flame paths from the firebox (to increase the time available for heat transfer), and good air movement around the appliance.

Figure 1 illustrates the principles of combustion and heat transfer. High efficiency appliances have several advantages. They are airtight and use less combustion air, which means less household air is lost up the chimney. They use less fuel, so you spend less money buying wood and less time preparing it. Finally, they burn cleaner and require less maintenance.

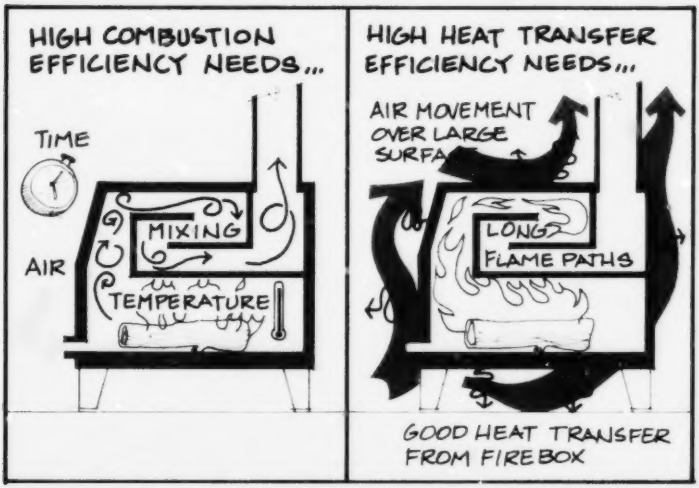


**Figure 1 Principles of combustion and heat transfer efficiency.**

When you start looking at appliances, check that they are certified by the Canadian Standards Association (CSA), the Underwriter Laboratories of Canada (ULC) or Warnock Hersey (WH). The Standards Council of Canada recognizes all of these organizations as certifying agencies for wood and coal appliances. All certified appliances have labels. Certification ensures that an appliance is safe to operate within the guidelines described on the label and in the operator's manual.

The overall efficiency of stoves ranges between 45 and 80 per cent. Fireplaces are generally not as efficient as stoves, averaging between 35 and 60 per cent for well-designed units. Conventional masonry fireplaces are the least efficient at between -10 and 10 per cent.

# Wood Stoves

## Circulating versus radiant stoves

A circulating stove has a casing or channels around its exterior where air circulates, either by natural convection or with the assistance of fans. The air picks up heat from the stove and then flows throughout the room. Radiant stoves, by contrast, heat objects rather than air (Figure 2). Because air flows around them more, circulating stoves can have higher heat transfer efficiencies than radiant stoves.

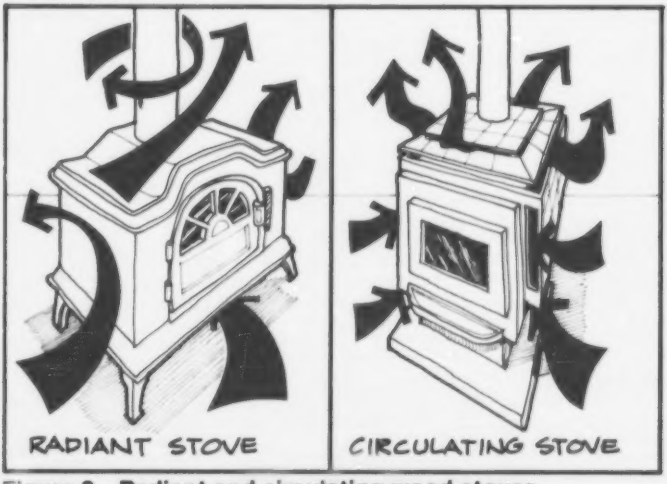


**Figure 2 Radiant and circulating wood stoves.**

Some people prefer circulated warm air because it heats rooms more evenly. Some circulating stoves also have cooler surfaces than radiant stoves, which makes them safer around small children.

## Steel versus cast iron stoves

There are different opinions as to the best choice between cast iron and steel. Advocates of cast iron point out that you can warp a steel stove if you get it too hot. Advocates of steel like its cheaper price. Properly maintained, either kind of stove can provide years of efficient heating.

Whatever kind of stove you buy, check that the joints are tight. Cast iron stoves are assembled and the joints should be sealed with stove cement or a combination of gaskets and stove cement. The joints on steel stoves are welded.

Stoves can also be made of soapstone or tile. If well constructed and properly used, they will also have good durability. Soapstone and tile have higher mass than metal, and so store heat better but warm up more slowly. They generally have better combustion efficiencies because their interior temperatures are higher, however heat transfer efficiencies are lower.

## Airtight construction

Airtightness reduces the amount of excess air that enters the firebox. Excess air cools and dilutes gases in the firebox and exhausts them more quickly up the chimney. This reduces both heat transfer and combustion efficiencies. Airtight stoves allow a controlled rate of combustion, controlled heat output, and reduce the amount of household air lost up the chimney. Airtightness is also a good safety feature because, by shutting down the air supply on the stove, you have better control over chimney fires.

An airtight stove has dampered air inlets and tight-fitting doors with gaskets (Figure 3). To check the airtightness of a stove, make sure its doors fit tightly. Close the doors on a piece of paper. If you can pull the paper out easily, the doors are not tight enough. Check the dampers on the air inlets to make sure they also close tightly.

## Baffles

Baffles are metal plates between the firebox and the stove flue (Figure 4). They are designed to make hot gases from the fire take a longer route to the chimney. This increases the amount of time available for the gases to burn and transfer heat to the stove's exterior. Baffles also help mix gases and air by adding some twists to the exit route. The most a baffle will add to efficiency is about two to three per cent.

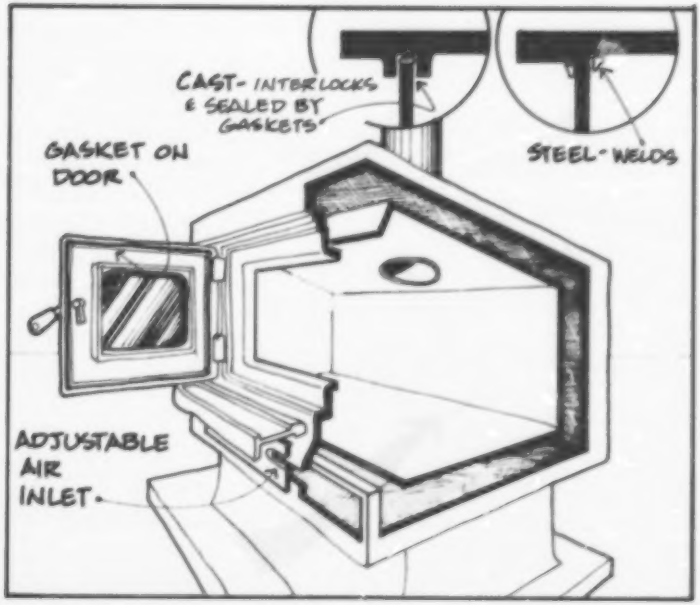


Figure 3 Airtight wood stove.

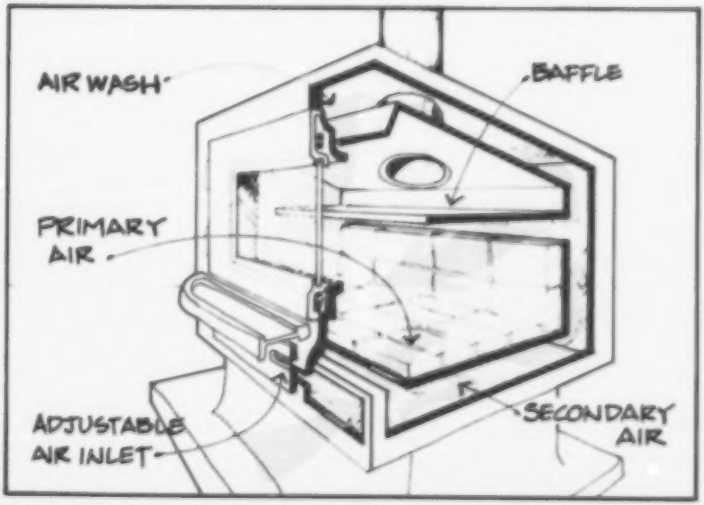


Figure 4 Some wood stove features.

## Secondary air inlets

A stove always has a primary inlet for air that provides air directly to the fire. A secondary air inlet (Figure 4) introduces more air higher in the flame path where a lack of oxygen often inhibits combustion. Secondary air improves combustion efficiency, but may reduce heat transfer efficiency because it cools gases upstream of the fire. The overall effect of secondary air on stove efficiency is small.

## Insulating stove liners

Firebrick is a common insulating liner, but some stoves come with metal liners (Figure 4). Both keep the temperatures inside the stove higher, which improves combustion efficiency. They reduce, however, heat transfer from the interior to the exterior of the appliance. There is little effect on overall efficiency, but liners can help protect the firebox from heat-induced deterioration.

## Catalytic combustors

A catalytic combustor (Figure 5) is a specially coated ceramic mesh which is located above the fire at the top of the stove. Combustion gases that pass through it will burn more completely. This results in more complete combustion, and so more heat and less creosote. Catalytic combustors can reduce creosote build-up by as much as 50 per cent and improve overall stove efficiency by as much as 10 per cent. Some stoves come with combustors built in, but you can also buy them as accessories.

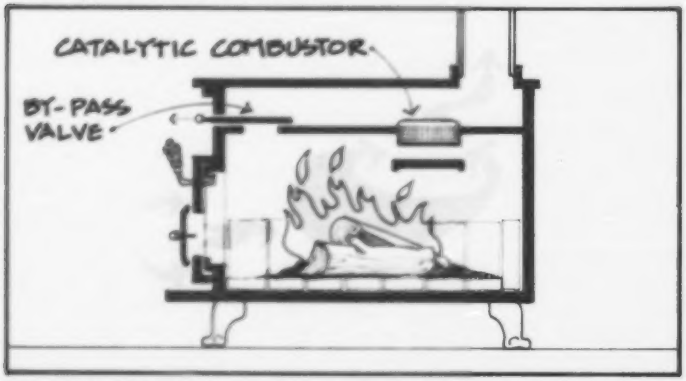


**Figure 5 Wood stove with a catalytic combustor.**

Your fire must be above a certain minimum temperature before the combustor will work. There is a manual bypass valve in stoves that come equipped with combustors that allows you to send the smoke directly up the chimney until the minimum temperature is reached. Buy a stove-top thermometer so you can monitor the temperature of your fire and follow the operating instructions.

You can damage a combustor with prolonged exposure to hot fires and by burning things other than wood such as coal, newsprint, gift wrap and plastic.

## What is the best combination of features in a wood stove?

The best combination of features mostly depends on how you want to use the appliance.

- Do you plan to heat with it? We recommend an airtight design if you plan to heat with wood. It improves the overall efficiency of the system and allows you to control the heat output of your fire. If you burn wood for recreation, choose a simple stove without features that require careful operation such as catalytic combustors. A zero-clearance fireplace, fireplace insert or one of the improved designs for masonry fireplaces may be a more appropriate choice for recreation.
- Do you want to sustain fires over long periods of time? For example, do you want the fire to last overnight or through the day while you are at work? If so, you will definitely want an airtight stove that allows a controlled, long, low-output fire. If this is the way you plan to operate your appliance most of the time, a catalytic combustor could be useful because low fires are smoky and result in a lot of creosote. You need to be sure, however, that your fire remains hot enough for the combustor to work.
- Do you want to reduce maintenance and the risk of chimney fires? Consider features such as catalytic combustors, secondary air inlets and insulating stove liners, all of which help control creosote.
- Do you want to be able to burn things other than wood in your appliance? If you want to burn paper and cartons occasionally, for example, or if you are not sure you will see everything your children put into the fire, do not get a catalytic combustor. It is easily contaminated and once contaminated, will not work.

- Do you want an appliance that requires little monitoring while it is operating? Some features only work well within a certain operating range. For example, secondary air inlets work best with a brisk fire. Catalytic combustors need a minimum temperature to be activated and can be damaged by frequent or long-burning hot fires. If it is not convenient for you to adjust the fire while it is burning, you may want to avoid these features.
- Do you have small children? If so, you might prefer a circulating over a radiant heater because the exterior surfaces are usually cooler. Insulating liners also reduce the surface temperatures of stoves.

There are, of course, other things to consider when choosing a stove including cost, warranties and appearance. Consider whether the appliance is easy to use: would you prefer a front-loading, top-loading or side-loading stove? If you plan to install the stove yourself, how difficult will it be? Check the certification and manufacturer's instructions to make sure the stove can be safely installed where you want it. Check with your insurance company to see if installing a wood stove requires a change in your policy.

## Coal Stoves

Coal has two advantages over wood: it is cheaper to buy and will sustain a fire longer. A longer burn may be useful if you need to keep your appliance operating overnight, during the day while you are at work, or over weekends. Coal burns hotter than wood, however, and leaves more ash. It requires the right equipment and more care. **If you plan to burn any coal, you must get a coal-burning appliance. Do not burn coal in a stove not specifically designed for it.**

The design options for coal stoves are much the same as for wood stoves and have similar effects (Figure 6). Airtightness is as useful for coal stoves as for wood because it allows you to control the length and intensity of the burn. Some features, however, are more crucial. Coal stoves are usually cast iron because they have to withstand higher temperatures. Coal also leaves a lot more ash than wood, which is why coal stoves have special grates that allow you to shake the ash out of the burning fuel. The grates are set high above the bottom of the firebox to allow for the heavier ash accumulation. Coal burns best if the primary air inlets are below the bottom of the grate so that oxygen filters up through the embers.

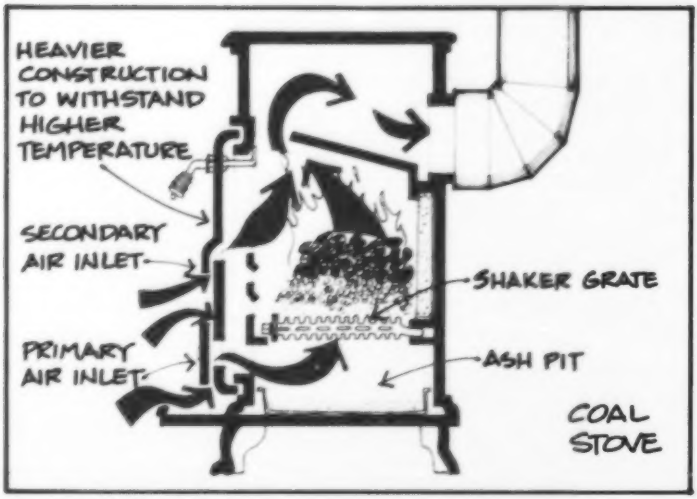


**Figure 6 Coal stove.**

Barometric draft controls are a useful safety feature on coal stoves. A draft is the upward movement of air through a chimney caused by hot gases rising. It exhausts smoke and draws fresh air into the firebox for burning. If a draft becomes too strong, it can cause a run-away fire that can burn dangerously hot, especially with coal. Barometric draft controls allow room air into the chimney when the draft gets very strong, cutting the draw of air into the fire. **Catalytic combustors cannot be used with coal stoves because the coal contaminates them.**

As with any appliance, follow the instructions on the certification label and in the owner's manual when installing and operating a coal stove.

# Fireplaces

Most fireplaces are for recreation. If they are well designed, they can contribute to your home heating, but you should think of them as secondary heat sources at most. Rely on other appliances, such as a furnace, to keep your house warm.

The conventional masonry fireplace is the least efficient design. Choose a more efficient option such as an improved masonry design, a zero-clearance fireplace or a fireplace insert. These allow the look of a traditional masonry mantle, but avoid the cold drafts and inefficient use of wood typical of the conventional masonry fireplace.

## Improved masonry designs

If you want an open masonry fireplace, choose one of the improved designs (Figure 7). A shallow firebox with a slanting back, such as the Rumford design, can radiate twice as much heat as a conventional square firebox. Good damper systems in the chimney reduce drafts and household air losses. Many designs are more massive than conventional brick fireplaces, and this allows them to store a great deal of the heat energy from the fire that is normally lost. The overall efficiency of some of these fireplaces is as high as 35 to 40 per cent – a big improvement over the conventional -10 to 10 per cent.

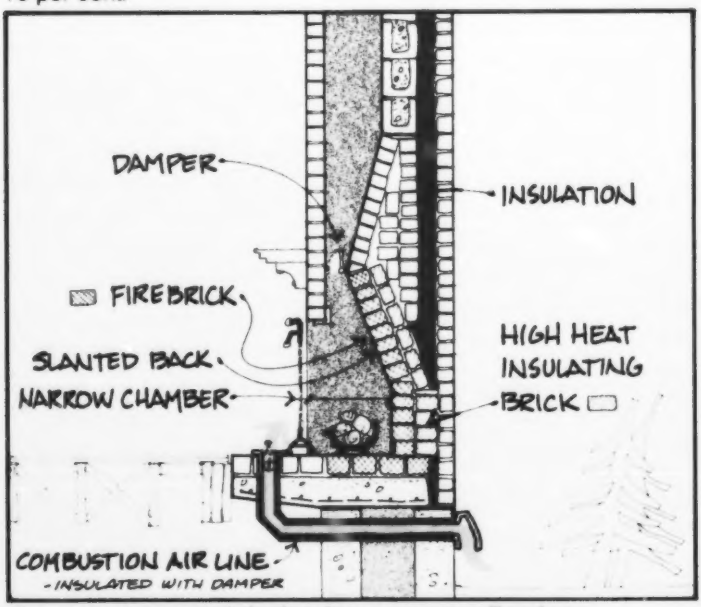


**Figure 7 Improved design for a masonry fireplace.**

## Zero-clearance fireplaces

These are sometimes called factory-built fireplaces and are designed to have cool exterior surfaces. This allows the spacing, or clearances, between these appliances and combustible materials to be minimized. Within proper guidelines, you can install a zero-clearance fireplace into a wood-framed wall.

Figure 8 shows a typical zero-clearance fireplace. It has vents, with or without fans, that allow air to circulate around the firebox. It delivers both radiant heat and warm air to a room.

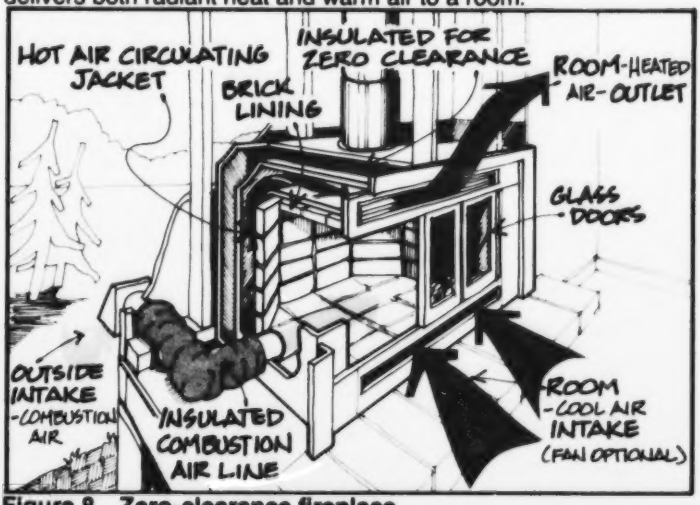


**Figure 8 Zero-clearance fireplace.**

Though glass doors are a common feature, zero-clearance fireplaces are not as airtight or efficient as airtight wood stoves. The doors control household air losses, but do not eliminate them. Ceramic glass doors can be more airtight than tempered glass doors because they can withstand higher temperatures. Tempered glass doors need air leaks to keep them cool and prevent them from breaking. To get the most heat from your fire, keep the glass doors open when the fire is brisk and close them when it dies down.

Most zero-clearance fireplaces have combustion air inlets for the firebox. This means that you do not have to supply combustion air separately (see the discussion on combustion air in the installation section). The inlets have dampers that allow you to close them when the appliance is not lit and to help control the fire.

A good zero-clearance fireplace will have a large heat transfer area around the firebox, good air flow through the vents and reasonably tight glass doors. Check the flue damper as well for a good tight fit because this will reduce household air losses when the appliance is not lit.

## Fireplace inserts

Inserts are like airtight wood stoves encased in a masonry wall (Figure 9). They are generally less efficient than wood stoves because they have less surface area exposed for heat transfer. Inserts are usually installed into existing open masonry fireplaces but they can be built into new masonry as well.

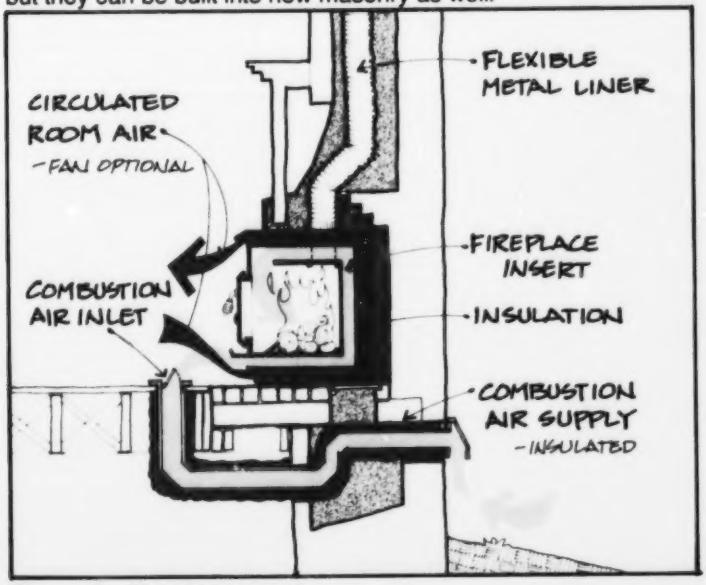


**Figure 9 Fireplace insert.**

Inserts have vents that allow air to circulate around the firebox, sometimes with the assistance of fans. Since they are airtight, inserts use little household air and you can adjust the burn to supply the amount of heat you want. Look for tight-fitting doors and air inlets, a large area around the firebox where air can pick up heat, and good air flow through the vents.

Unlike factory-built fireplaces, inserts are not designed to minimize clearances. Be sure to respect clearances when you install an insert and never put them into a wood-framed wall. If your masonry housing for the insert is on an exterior wall, make sure you insulate the back of the appliance to prevent excessive heat loss to the outside.

## Improvements to conventional fireplaces

If you have a conventional masonry fireplace that is drafty and cold, there are some ways to improve it. The most expensive, but most effective route is to install an insert or a stove. A zero-clearance fireplace can also be adapted to an existing fireplace, but the installation is more difficult because the fireplace must be installed with its approved chimney and accessories. An insert can usually sit right inside the existing fire chamber. A stove will always sit in front of the chamber and change the appearance of the fireplace considerably. Your choice should be a stove if you want to start burning wood for space heating, and an insert if you want a more efficient recreational fireplace.

Installing an insert into an existing fireplace poses a few extra problems. Clearances need to be respected and you may need to modify your fireplace to allow for them. The connection between the insert and the chimney is also hidden inside the wall and usually cannot be straight. This makes the connection difficult to inspect and clean, and with some installations you have to pull the insert out to gain access to the connection.

If you install a stove or an insert, you should also install a new rigid or flexible stainless steel chimney liner. A new liner will make the appliance safer and easier to light. It will also collect less creosote and be more resistant to corrosion (see the discussion on chimneys in the installation section). In addition, it is a good idea to install an insulated combustion air line. This will reduce the amount of household air that the fire burns, make your fireplace easier to light and contribute to its safe operation (see the discussion on combustion air in the installation section).

A cheaper method to improve the efficiency and operation of a conventional masonry fireplace is to bring in combustion air and install glass doors (Figure 10). The combustion air has the same benefits described above and the glass doors will reduce the loss of household air. Doors can be custom-made to fit your fireplace.

Remember that ceramic glass doors can be more airtight than tempered glass.

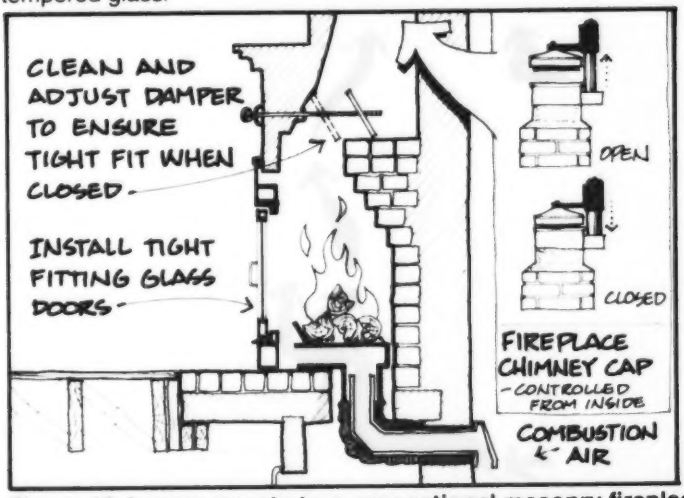
CLEAN AND ADJUST DAMPER TO ENSURE TIGHT FIT WHEN CLOSED
INSTALL TIGHT FITTING GLASS DOORS
OPEN
CLOSED
FIREPLACE CHIMNEY CAP - CONTROLLED FROM INSIDE
COMBUSTION AIR

**Figure 10 Improvements to a conventional masonry fireplace.**

Rather than glass doors, and for less money, you can install a chimney top damper or build a fireplace plug. A chimney top damper is installed at the top of your chimney and is operated from inside the house with pulleys. Closing the damper prevents drafts and household air losses. To build a fireplace plug, frame a box that fits snugly into the opening of the fireplace. Insulate inside the box with batt or rigid insulation, cover it with drywall or plywood, and weatherstrip it around the edge. The plug seals off the mouth of the fireplace when it is not lit and prevents household air from escaping up the chimney. Make sure your fire is completely out before inserting a fireplace plug.

## What is the best combination of features in a fireplace?

The best combination of features depends on what you want out of your fireplace.

- Do you want to modify your fireplace to heat your home? If so, you should install a stove.

- Do you want improved performance from a recreational fireplace? The cheapest method to improve a conventional masonry fireplace would be to install a combustion air inlet and build a fireplace plug or add a chimney top damper. These will decrease the amount of household air lost up the chimney and reduce the drafts coming down. If you are installing a new fireplace, consider one with better efficiency built in – an improved masonry design, a factory-built appliance or an insert.

Choose a fireplace that suits your tastes and budget. Consider how easy it will be to use. Before you buy, check the warranties and make sure you can install the fireplace where you want it. Check to see if your plans for a fireplace alter your house insurance policy.

## Sizing Your Appliance?

If you are serious about using wood as your primary source of heat, buying a properly sized appliance is crucial. The right size depends on:

- how big an area you want to heat. Do you want to heat a single room? Several rooms? The whole house? You need a bigger appliance to heat a bigger space. If you want to heat more than one room, make sure you have a good method of distributing the heat (see the next section on heat distribution).

- the heat loss characteristics of the space. To find out how much heat a space needs, you need to know how quickly it loses heat. A heat loss calculation will determine this. **Call Energy Matters (dial zero and ask for Zenith 22339 or call 427-5300 in Edmonton)** for more information on how to do a heat loss calculation, or ask your contractor or heating appliance salesman.

Buying an oversized wood heater is a common mistake. As a general rule, it is better to install an undersized appliance than oversized one. You can always back up an undersized appliance with other space heaters. But if you try to operate an oversized appliance below its design capacity to avoid overheating a space, the result will be smoky fires that deposit more creosote in your appliance and chimney. This means you will spend more time checking and cleaning your system.

# Installing Your Appliance

This section outlines some points about installation that contribute to the safe and efficient operation of fireplaces and stoves, but it is not a comprehensive guide. **Always follow manufacturer's instructions and building code requirements carefully.**

## Clearances

Clearances are the safe distances between materials that can burn and your appliance or chimney. The need to keep some objects, such as furniture and paper, clear of your appliance is obvious. But clearances also apply to the wood framing in your walls, floor and ceiling.

Clearances vary with different appliances and are specified on the label that all approved appliances carry. They typically range from half a metre to a little over a full metre (20 to 40 inches). The specially designed zero-clearance fireplaces do not need such large spacing, although some spacing is still required. Clearances can be reduced with properly installed barriers to protect combustible materials. For example, you can reduce clearances to a wood-framed wall by 50 per cent with a solid brick barrier spaced 2.5 cm (one inch) away from the wall. The barrier must allow air to circulate behind it and be supported away from the wall by non-combustible spacers.

Clearances are specified in the Alberta Building Code. It is important to plan enough room around your appliance to respect clearance requirements or to plan for ways to reduce them. **Call Energy Matters for more information; dial zero and ask for Zenith 22339 (427-5300 in Edmonton).**

## Chimneys

Solid fuel appliances are now required to have a factory-built 650 degree centigrade (1200 degree farenheit) chimney, which is an insulated steel chimney specifically approved for this application. This is a fairly recent regulation and older wood-burning appliances in your home may not be up-to-date. Check and replace any chimneys that are deteriorating. If you are installing an insert or stove into a traditional masonry fireplace, you should put a new stainless steel liner inside the existing clay flue. This will add to your costs, but the chimney will be safer. The sizing will also be better,

the chimney will be more resistant to corrosion, and the exit temperature of the smoke will be higher, resulting in less creosote and a better draft.

Your chimney should be the same size as the flue collar on your appliance. If a chimney is too big, the exiting smoke will cool too much to maintain a good draft and will condense as creosote. If too small, the chimney will not be able to exhaust enough smoke to keep the fire burning efficiently. **Follow the manufacturer's installation guidelines carefully.**

To ensure your chimney is the proper height, follow the guidelines in Figure 11. The distances specified are minimum distances, but it is important not to make your chimney too tall. Smoke can cool too much in a tall chimney, resulting in condensation and creosote build-up.

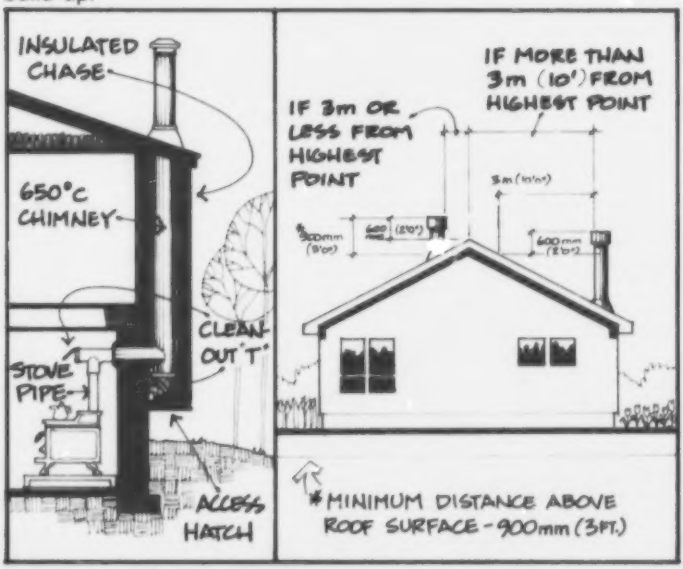
INSULATED CHASE
650°C CHIMNEY
CLEAN-OUT 'T'
STOVE PIPE
ACCESS HATCH
IF MORE THAN 3m (10') FROM HIGHEST POINT
IF 3m OR LESS FROM HIGHEST POINT
*MINIMUM DISTANCE ABOVE ROOF SURFACE - 900mm (3FT.)

**Figure 11 Chimney details.**

Keep the stovepipe that connects your appliance and the chimney as short and straight as possible. This will promote a good draft and reduce creosote, which tends to collect in bends of stovepipe. You can get single-walled or double-walled stovepipe. Single-walled will allow greater heat transfer from the exiting smoke to the room, which will improve the overall efficiency of your system. Double-walled

pipe inhibits heat transfer, but keeps exiting smoke at a higher temperature. This reduces creosote build-up. Double-walled stovepipe also allows smaller clearances than single-walled pipe. Keep all of your stovepipe visible; do not run it through closets or false walls. Stovepipe is not meant to be as durable as your chimney and you need to be able to check it easily for corrosion.

Install your chimney and stovepipe with ease of inspection and cleaning in mind. A perfectly vertical installation is the easiest to inspect and clean. If this type of installation is not possible, put clean-out doors in convenient places for looking inside the stovepipe and chimney (Figure 11).

Try to put your chimney on an inside wall. This will keep it warmer and a warm chimney has better draft, less corrosion and less creosote build-up. If you have to install your chimney on an outside wall, build an insulated chimney chase around it. Frame around the chimney up the side of the house and be sure to respect clearances. Insulate inside the framing and support the insulation to stop it from slumping against the chimney. Finish the outside of the chase with stucco or siding to match the exterior of your house.

## Combustion Air

**Every fuel-burning appliance should have its own combustion air supply, including stoves, furnaces, heaters and fireplaces. Otherwise, these appliances can depressurize your home and result in serious backdrafting problems.** Backdrafting happens when air is sucked down one of the chimneys to make up for air exhausted by some other appliance (Figure 12). If this happens to your furnace or wood or coal appliance while it is operating, it can spread toxic gases through your home, including carbon monoxide.

Combustion air is especially important in an airtight house which has fewer leaks where replacement air can seep in. It is also extremely important in mobile homes because they are small, enclosed spaces. To be used in mobile homes, wood-burning appliances must be specially approved.

Many zero-clearance fireplaces come with pipes that supply combustion air directly to the firebox from the outside. If you are installing a line for an existing open masonry fireplace, be sure to bring it to the front of the fire chamber. This will keep the inlet from blowing sparks out into the room. Sometimes you can adapt an old ash clean-out as a combustion air supply (Figure 10).

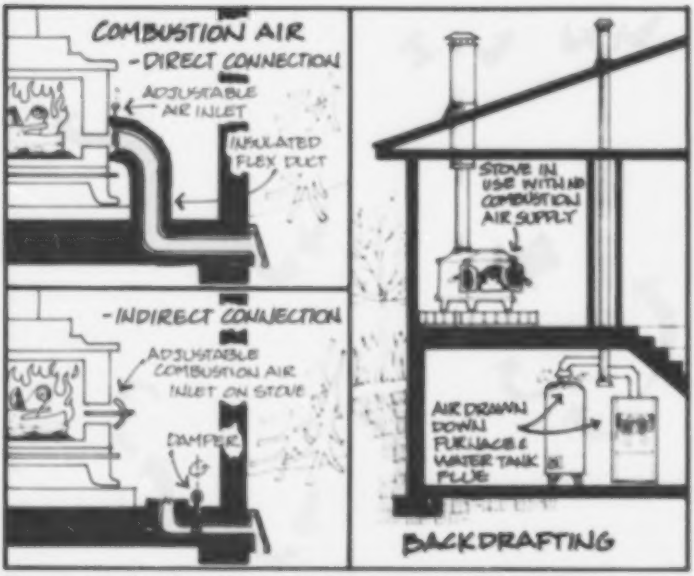


**Figure 12 Combustion air inlets prevent backdrafting.**

Kits are available to connect a combustion air line directly to the air inlet control on airtight stoves and inserts. Some stoves are designed to enclose a combustion air line in the housing that sits on the floor below the firebox. You can also install a combustion air line to feed near an appliance with a damper system that will allow you to open and close it (Figure 12).

All combustion air lines must be insulated. The diameter of pipe you need increases with the output of the appliance and is specified in the Alberta Building Code. **Call Energy Matters for more information (dial zero and ask for Zenith 22339 or call 427-5300 in Edmonton).**

## Heat Distribution

This is especially important for space-heating appliances (as opposed to recreational types). You should plan to install the appliance in an area where you spend a lot of time. This is where you want the heat most and can tend the fire conveniently.

Figure 13 illustrates some heat distribution options. If you want to distribute the heat throughout your home and have a forced-air

furnace with a two-speed fan, you can use the furnace fan. This works especially well if the return air ducts are installed high in the room containing the wood heater. The ducts will draw warm air off the ceiling where it tends to collect. Consider a high return air duct if you are renovating a home or building a new home that will use wood heating and a back-up forced-air furnace.

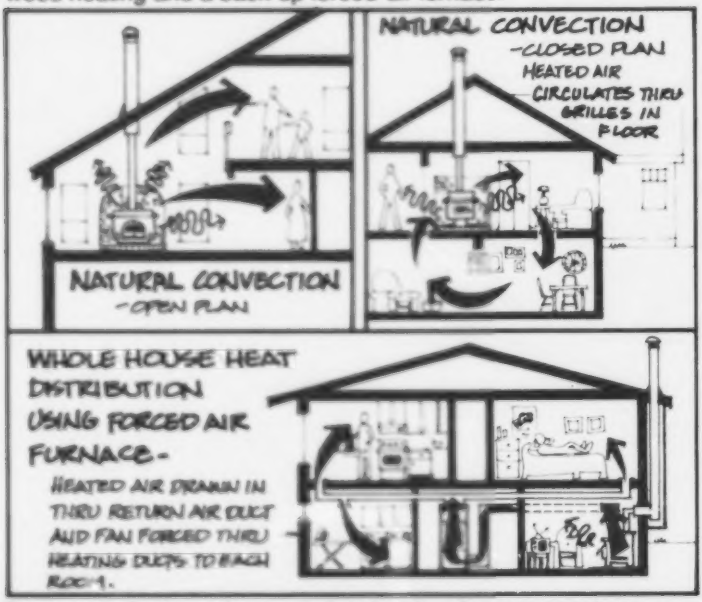


**Figure 13 Options for heat distribution from a wood stove.**

You can also distribute heat by installing vents between rooms or floors, with or without fans. This would be your best option if you want to heat only a few rooms rather than your whole house. An open floor plan is another way to achieve good heat distribution because there are few walls to block air movement. If you are planning wood heating as part of a new home or major renovation, consider an open floor plan.

# Operating and Maintaining Your Appliance

This section describes some routine maintenance that every wood appliance needs. Always read your owner's manual and follow the instructions carefully.

## Routine Maintenance

Before each heating season, you should check your appliance thoroughly. Figure 14 shows points for routine maintenance of a stove. Check the condition of the dampers and hinges, any insulating liners, gaskets around the doors of airtight appliances, and the stovepipe. Replace any parts that show wear or corrosion. Make sure your appliance, stovepipe and chimney are creosote free.

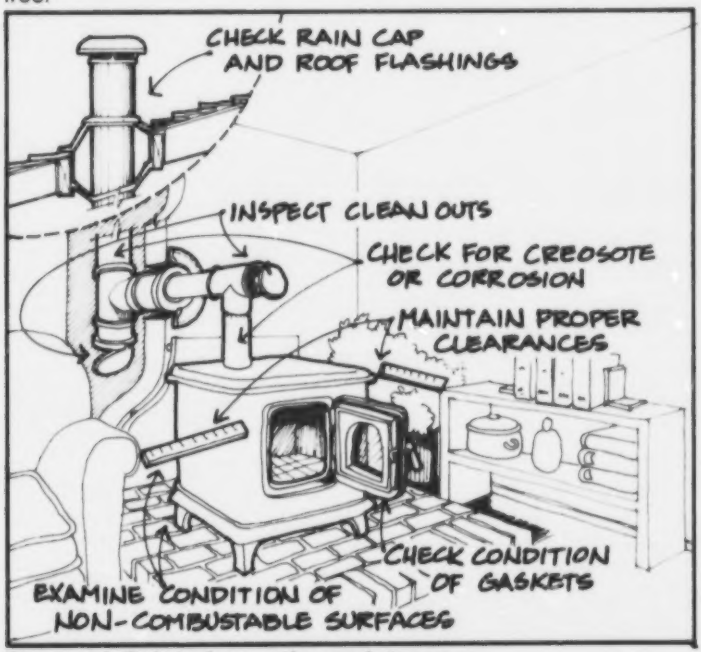
CHECK RAIN CAP AND ROOF FLASHINGS
INSPECT CLEAN OUTS
CHECK FOR CREOSOTE OR CORROSION
MAINTAIN PROPER CLEARANCES
CHECK CONDITION OF GASKETS
EXAMINE CONDITION OF NON-COMBUSTABLE SURFACES

**Figure 14 Points for routine maintenance.**

If you have a catalytic combustor, make sure it has not become clogged. Clean the entry and exit surfaces with a soft brush. Do not scrape the combustor or clean inside the mesh.

You should also measure your clearances to make sure that such items as furniture and stacked wood are still a safe distance from your appliance.

## Chimney Maintenance

The main task in chimney maintenance is to remove creosote. If creosote builds up too much, it can catch fire. A chimney fire can damage your chimney or even burn down your house.

Creosote can also corrode your chimney and your appliance. If it gets thick inside your appliance, it acts as an insulator and cuts down on heat transfer to the exterior.

Creosote is formed by the condensation of gases and the deposition of particles from the smoke of wood or coal fires. The cooler your chimney, the more gases will condense and the more creosote you will get. You will also get more creosote if you burn fires that produce a lot of smoke, such as low-output fires.

How often you need to clean your system depends on your appliance and how you use it. The only way to know is to visually inspect the chimney and the stovepipe. When you first install an appliance, inspect it frequently – every week or two – until you have established the rate of creosote formation. Install clean-out doors to allow easy inspection of your stovepipe and chimney.

If you have creosote deposits that are a quarter inch, it's time to clean. You can hire professional chimney sweeps or do the job yourself. If you do it yourself, you should use the same equipment as the professionals. You will need a wire bush that fits snugly inside your chimney, lengths of handle to attach to the brush, and a smaller brush to clean inside corners of your connectors.

If you are cleaning the chimney from above, be sure to close off your appliance below to keep soot and scalings from spreading around the house as you brush them down. If cleaning from below, you will need a heavy-duty vacuum to keep the dust from spreading.

You can reduce creosote, but you cannot eliminate it. The more completely you burn your wood and smoke, the less creosote you will have. Some appliances have features such as catalytic combustors and insulating stove liners that increase the combustion efficiency of the appliance. The way you use your appliance also affects creosote build-up. Frequent small, brisk fires will deposit less creosote than big low-burning fires. Chimney characteristics are important too. Your chimney should be properly sized and installed on an interior wall if possible to keep exiting gases hot. Chimneys on exterior walls should be well insulated from the outside.

## What To Do If You Have a Chimney Fire

A chimney fire can start a house fire. Take these steps:

- Evacuate every one from the house.
- Call the fire department.
- If you can, spray chemical fire extinguisher into the appliance and shut off air inlets.
- Leave the house yourself.

## Wood Preparation

Use dry wood for your fires. Wood with a high moisture content, such as freshly cut green wood, burns less efficiently.

The best way to dry wood is to:

- Split it. The smaller the pieces, the more quickly they will dry.
- Stack it. Stack your wood to allow good air movement through the pile. This will speed up drying. Stack the wood in layers of alternating directions and let it stand free instead of leaning it against a building (Figure 15).
- Store it. Keep the wood pile dry with tarpaulins or a make-shift roof for at least six months. Do not store wood inside to dry. It will produce a lot of moisture and may cause excess humidity in your house.

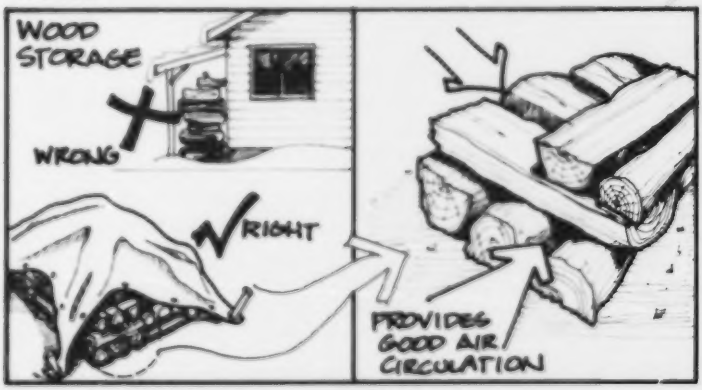


**Figure 15 Guidelines for wood stacks.**

Table 2 lists the energy content per dry cord of woods native to Alberta. If you are heating with wood, the amount you need depends on the output of your stove and the energy content of your wood. The higher the energy content of the wood, the less you need to meet your heating requirements.

**Table 2 – Energy Content of Woods Native to Alberta**

| Species | Energy Content per Cord |
|---|---|
| White Birch | 25 GJ (23.6 million BTU) |
| Tamarack (Larch) | 23 GJ (22 million BTU) |
| Douglas Fir | 21 GJ (20 million BTU) |
| Pine (Lodgepole, Jack) | 19 GJ (18 million BTU) |
| Aspen (White Poplar) | 18.4 GJ (17.4 million BTU) |
| Alder | 18.1 GJ (17.2 million BTU) |
| Spruce (Black, White) | 18 GJ (17.1 million BTU) |
| Willow | 17.9 GJ (17 million BTU) |
| Balsam Fir | 16 GJ (15.3 million BTU) |
| Balsam Poplar (Black Poplar) | 15.8 GJ (15.1 million BTU) |

## Tips for Safe Wood Burning

- Make sure you cut your wood the right length for your firebox.
- Be careful not to overload your appliance with wood. An over-fired appliance can get dangerously hot and crack or warp.
- If you have an airtight appliance, you can control the burn by adjusting the air inlets. You can achieve a longer, sustained burn by closing down the inlets. Remember that this type of fire will produce more smoke and creosote. Stoking your fire up to a good brisk burn for 20 to 30 minutes after each slow burn will help reduce creosote build-up.
- Do not burn treated wood. It gives off toxic and potentially corrosive gases. Do not burn large quantities of paper or boughs. These burn quickly and give off an intense heat that could start a chimney fire. Do not burn artificial logs in a stove or burn more than one at a time in a fireplace. They often contain paraffin which burns very hot.
- Keep a fire extinguisher handy.

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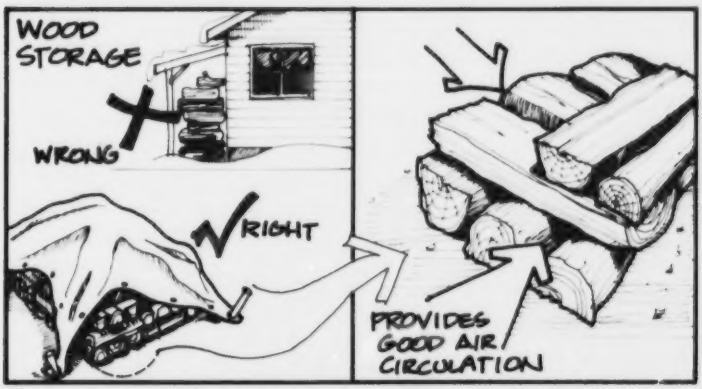


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- Keep your smoke detector in good repair and make sure it is in a good location to detect smoke.
- Do not dispose of ashes until they are cold. Clean ashes into a metal pail.
- Never use fire-starter, gasoline, kerosene or other similar fuels to start your fire.
- Inspect your appliance and chimney frequently for creosote and clean them regularly.

## Summary

Before you look at fireplaces or stoves, decide:

- whether you want an appliance for recreation or heating
- whether you are ready for the routine chores of maintaining a fireplace or stove
- whether you have a ready source of fuel
- whether you want to burn wood or coal
- the type of appliance you want and the features you need.

Look for approved appliances, and be sure the one you choose is installed properly and regularly maintained.

If you follow these steps, your fireplace or stove should meet your expectations of cost, convenience and efficiency. It will operate safely and reliably for many years.

Zenith 22339 (Edmonton 427-5300)
Call this number to reach the "Energy Matters" inquiry service. The hotline experts can provide you with more information on wood heating and answer your specific questions on this and other energy conservation products and techniques.